SWITCHABLE LIGHTNING ARRESTER SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to switchable contact of lightning arresters to power lines on power poles and on or near transformers.

Currently, the most commonly used lightning arresters on power poles and on or near transformers are not designed to continue to operate repeatedly after nearly all lightning strikes, but to be sacrificial with designedly predetermined self-destruction from lightning electrical surges in excess of design amounts which are most typically 10 KV.

After sacrificial self-destruction, the lightning arresters must be replaced promptly at high risk by line workers. The high risk results from not shutting down power lines to a self-destructed lightning arrester while line workers electrically connect a replacement lightning arrester to a power line in order to avoid interruption of electrical service to residential and commercial power users and in order to save high power-plant costs. For initial installation of lightning arresters, power to power lines and transformers can be delayed until the lightning arresters are installed. Shutdown of a power line is expensive and time consuming for single and separate replacement of lightning arresters because (a) high power-plant-employee costs in addition to power-line workers are required and (b) shutdown for a single power line or transformer often requires shutdown of branched power lines to a plurality of users. Accordingly, power-line workers are often under employment pressure to avoid injury-preventive shutdowns for replacing single lightning arresters. Generally, the replacement can be accomplished safely, but serious injury and death of line workers result frequently from unexpected electrical surges and

from accidental occurrences during replacement and electrical-line contact of the lightning arresters without safety shutdowns.

There is no known switchable lightning-arrester system for allowing replacement of lightning arresters with safe electrical connection to a power line without interrupting electrical service and without expensive power-plant shutdown of power in a manner taught by this invention.

Examples of most-closely related known but different devices are described in the following patent documents:

U.S. Patent No.	Inventor	Issue Date
2,296,991	Fox	09-29-1942
3,614,700	Beard, *et al.*	10-19-1971
3,497,148	MacDonald	08-07-1990
4,688,013	Nishikawa	08-18-1987
4,546,341	McNaghten, *et al.*	10-08-1985
4,795,996	Brown, et al.	01-03-1989
4,814,550	Newberg	03-21-1989
4,450,425	Manning	05-22-1984

SUMMARY OF THE INVENTION

Objects of patentable novelty and utility taught by this invention are to provide safe, quick, convenient and inexpensive line work and replacement of lightning arresters following lightning damage; and

to provide optional utilization or non-utilization of conventional power-line structure and technology of lighting arresters with the safety-switchable lightning-arrester system.

This invention accomplishes these and other objectives with a switchable lightning-arrester system having a safety-switchable connector which can include a

counter-lever safety connector, a slide safety connector, a hinged safety connector or a pivot safety connector intermediate a power line and a lightning arrester for on-spot disconnection to protect workers from self-destructing arresters when changing lightning arresters or working on damaged lines without costly, time-consuming and power-disruptive shutdown of power lines. This is highly important because the lightning arresters are changed and repair work is done on damaged lines as quickly after self-destruction from lightning surges as possible when lightning storms are very likely to still exist in the area requiring the change and repair. The safety-switchable connectors are made to be operable and changeable from a safe distance remotely, which is preferably from a ground position near a light pole, a transformer or other line support. Many line-worker lives have been lost in the past without this safety-switchable connector.

The above and other objects, features and advantages of the present invention should become even more readily apparent to those skilled in the art upon a reading of the following detailed description in conjunction with the drawings wherein there is shown and described illustrative embodiments of the invention.

BRIEF DESCRIPTION OF DRAWINGS

This invention is described by appended claims in relation to description of a preferred embodiment with reference to the following drawings which are explained briefly as follows:

FIG. 1 is a partially cutaway side elevation view of a closed mode of a counter-lever embodiment of the switchable lightning-arrester system having a counter-lever safety switch and mounted on an arrester-attachment base for

attachment to a power-line support that can include transformers and light posts and for operation from an attachment side;

FIG. 2 is a partially cutaway side elevation view of the counter-lever embodiment mounted on the attachment base for operation from a different side than the attachment side;

FIG. 3 is a partially cutaway side elevation view of a top portion of the counter-lever embodiment in an open mode;

FIG. 4 is a side view of an open-lock pin;

FIG. 5 is a partially cutaway side elevation view of the counter-lever embodiment for use of a remote actuator that includes a contraction-force spring;

FIG. 6 is a partially cutaway side elevation view of the counter-lever embodiment for use of a remote actuator that includes a remote-control motor having a linear-actuation bar;

FIG. 7 is a partially cutaway side elevation view of a top portion of the counter-lever embodiment for optionally hand or remote-tool operation;

FIG. 8 is a partially cutaway side elevation view of a top portion of the counter-lever embodiment for optionally hand or remote-electrical operation and being in a closed mode;

FIG. 9 is a partially cutaway side elevation view of a closed mode of an embodiment of the switchable lightning-arrester system having a slide safety switch with a connection insert that is opened and closed from a lever side of a slide connector;

FIG. 10 is a partially cutaway side elevation view of an open mode of the **FIG. 9** illustration;

FIG. 11 is a partially cutaway side elevation view of a closed mode of an embodiment of the switchable lightning-arrester system having a slide safety switch with a connection insert that is opened and closed from opposite a lever side of the slide connector;

FIG. 12 is a partially cutaway side elevation view of an open mode of the **FIG. 11** illustration;

FIG. 13 is a partially cutaway side elevation view of a closed mode of the **FIG. 11** illustration with the control lever being on an opposite of the lightning arrester and with the control lever pivotal upwardly to the closed mode;

FIG. 14 is a partially cutaway side elevation view of a closed mode of an embodiment of the switchable lightning-arrester system having a hinged safety switch on a hinge rod in a hinge bay;

FIG. 15 is a partially cutaway side elevation view of the **FIG. 14** illustration; having a support connector for connecting an arrester-attachment base to a line-support platform independently of a power-line support or pole;

FIG. 16 is a partially cutaway front elevation view of the **FIG. 14** illustration;

FIG. 17 is a partially cutaway side elevation view of an open mode of the switchable lightning-arrester system having the hinged safety switch on a hinge rod removed from the hinge bay for being either removed for discard by downward travel or replaced and closed by upward travel;

FIG. 18 is a top view of the **FIG. 16** illustration;

FIG. 19 is a bottom view of the **FIG. 16** illustration;

FIG. 20 is a partially cutaway side elevation view of a closed mode of a pivot-connector embodiment with a pivot axle on an arrester side of a pivotal connection;

FIG. 21 is a partially cutaway side elevation view of an open mode of the **FIG. 20** illustration;

FIG. 22 is a partially cutaway front elevation view of the **FIG. 20** illustration;

FIG. 23 is a top view of the **FIG. 20** illustration;

FIG. 24 is a partially cutaway side elevation view of a closed mode of the pivot-connector embodiment with the pivot axle on a line side of the pivotal connection; and

FIG. 25 is a partially cutaway fragmentary side view of a top portion of an open mode of the **FIG. 24** illustration.

DESCRIPTION OF PREFERRED EMBODIMENT

Listed numerically below with reference to the drawings are terms used to describe features of this invention. These terms and numbers assigned to them designate the same features throughout this description.

1. Lightning arrester
2. Base end
3. Power-line end
4. Link bolt
5. Arrester fins
6. Ground end
7. Terminal end
8. Arrester-attachment base
9. Power-line support
10. Safety-switchable connector
11. Power line
12. Ground-line connector
13. Ground line
14. Counter-lever safety switch
15. Switch platform
16. Fulcrum pillar
17. Pillar end
18. Line-support arm
19. Support-arm axle
20. Switch-rod end
21. Power-line clamp
22. Switch rod
23. Control lever
24. Control-lever handle
25. Control-lever axle
26. Control-link rod
27. First link-rod end
28. First link axle
29. Second link-rod end
30. Second link axle
31. Open-lock aperture
32. Open-lock pin
33. Contraction-force spring
34. Pin ring
35. Remote-control motor
36. Linear-actuation bar
37. Wrench socket
38. Hand knob
39. Electrical socket
40. Slide safety switch
41. Slide platform
42. Slide-fulcrum pillar
43. Slide pillar
44. Line-support platform
45. Slide aperture
46. Slide rod
47. Connection insert
48. Slide-rod axle
49. Lever-link rod
50. Lever-link axle
51. Connector-side pillar groove
52. Lever-side pillar groove
53. Slide groove
54. Pillar stop
55. Lever stop
56. Hinged safety switch
57. Hinge rod
58. Hinge bay
59. Bifurcation arms
60. Handle base
61. Latch knob
62. Spring latch
63. Latch stop connector
64. Arcuate guides
65. Hinge-rod base
66. Support connector
67. Pivot safety switch
68. Connector base
69. First connector boss
70. Second connector boss
71. Connector plug
72. Pivot member
73. Pivot axle
74. Tapered sides
75. Tapered ends
76. Support pillar

Referring to **FIGS. 1-8**, the switchable lightning-arrester system can include counter-lever-switchable connection with a lightning arrester **1** having a base end **2**, a power-line end **3** and a link bolt **4** positioned internally from arrester fins **5**. The link bolt **4** has a ground end **6** proximate the base end **2** and a terminal end **7** proximate the power-line end **3**. An arrester-attachment base **8** is provided for receiving the base end **2** of the lightning arrester **1** for attaching the lightning arrester **1** to a power-line support **9**.

A safety-switchable connector **10** proximate the power-line end **3** of the line bolt **4** is articulated for open and closed switching of electrical communication from a power line **11** to the link bolt **4** and to a ground-line connector **12** proximate the ground end **6** of the link bolt **4** for connecting a ground line **13** to the line bolt **4**.

The safety-switchable connector **10** can include a counter-lever safety switch **14** having a switch platform **15** to which the terminal end **7** of the link bolt **4** is attached. A fulcrum pillar **16** is extended vertically upward from a pillar end **17** of the switch platform **15**. A line-support arm **18** is attached pivotally to a support-arm axle **19** proximate a top of the fulcrum pillar **16**. The line-support arm **18** is extended from proximate the support-lever axle **19** to a switch-rod end **20**.

A power-line clamp **21** on the switch-rod end **20** is positioned vertically above the link bolt **4** in a closed mode of the counter-lever safety switch **14**. A switch rod **22** is extended downward vertically from the line-support arm **18** for contacting the terminal end **7** of the link bolt **4** in a closed mode of the counter-lever safety switch **14**. The support-arm axle **19** is positioned horizontally on the fulcrum pillar **16** at a control-fulcrum distance upwardly from the switch platform **15**.

A control lever **23** having a control-lever handle **24** is attached pivotally to the fulcrum pillar **16** with a control-lever axle **25**. A control-link rod **26** has a first link-

rod end **27** attached pivotally to the line-support arm **18** with a first link axle **28**. The control-link rod **26** has a second link-rod end **29** attached pivotally to the control lever **23** with a second link axle **30**.

The control-link rod **26** is articulated and positioned intermediate the line-support arm **18** and the control lever **23** for transmitting downwardly locking force on the line-support arm **18** from downward travel of the control lever **23** and for transmitting upwardly unlocking force on the line-support arm **18** from upward travel of the control lever **23** as transmitted to the control-lever handle **24** selectively. The control-link rod **26** transmits a lock-shut mode of the counter-lever safety switch **14** with the switch rod **22** being in contact with the terminal end **7** of link bolt **4** by positioning of the first link axle **28**, the second link axle **30** and the control-lever axle **25** in a straight line for transmitting lightning power to the ground line **13** for a use mode of the lightning arrester **1**.

The control-lever handle **24** can be articulated for hand-grasping and for selectively remote grasping with a control rod.

The support-arm axle **19** is positioned a predetermined distance in a direction away from the pillar end **17** of the switch platform **15** for causing a predetermined central-actuation slant of the control lever **23**, below which opening of the counter-lever safety switch **14** with upward travel of the switch rod **22** is prevented by offsetting leverage.

An open-lock aperture **31** is articulated and positioned in the control lever **23** for receiving an open-lock pin **32** for preventing downward travel of the control-link rod **26** and thereby preventing unintended downward actuation of the control lever **23**.

The counter-lever safety switch **14** can include a remote actuator intermediate the fulcrum pillar **16** and the control lever **23** for remote actuation of the control lever **23** predeterminedly.

The remote actuator can include a contraction-force spring **33** in combination with the open-lock aperture **31** that is articulated and positioned in the control lever **23** for receiving the open-lock pin **32** for preventing downward travel of the control-link rod **26** and thereby preventing unintended downward actuation of the control lever **23** by the contraction-force spring **33**.

The open-lock pin **32** can include a remotely accessible pin ring **34**.

The remote actuator can include a remote-control motor **35** having a linear-actuation bar **36** extended from the remote-control motor **35** to pivotal contact with the control lever **23** for actuating the linear-actuation bar **36** outwardly in a direction away from the fulcrum pillar **16** for opening and inwardly in a direction towards the fulcrum pillar **16** for closing the counter-lever safety switch **14**.

The remote-control motor **35** can include a wrench socket **37** for rotation with a socket wrench.

The remote-control motor **35** can include a hand knob **38** for hand rotation.

The remote-control motor **35** can include an electrical socket **39** for receiving electrical current.

Referring to **FIGS. 9-13**, the switchable lightning-arrester system can include slide-switchable connection with the lightning arrester **1** having the base end **2**, the power-line end **3** and the link bolt **4** positioned internally from arrester fins **5** of the lightning arrester **1**. The link bolt **4** has the ground end **6** proximate the base end **2** and the terminal end **7** proximate the power-line end **3**. The arrester-attachment

base **8** receives the base end **2** of the lightning arrester **1** for attaching the lightning arrester **1** to the power-line support **9**.

The safety-switchable connector **10** proximate the power-line end **3** of the link bolt **4** for open and closed switching of electrical communication from the power line **11** to the link bolt **4** can include a slide safety switch **40** having a slide platform **41** to which the terminal end **7** of the link bolt **4** is attached detachably. Included also can be the ground-line connector **12** proximate the ground end **6** of the link bolt **4** for connecting the ground line **13** to the link bolt **4**.

The slide-fulcrum pillar **42** is extended vertically upward from a pillar end of the slide platform **41**. A slide pillar **43** is extended vertically upward from the slide platform **41** intermediate the slide-fulcrum pillar **42** and the link bolt **4**. A line-support platform **44** is attached pivotally to a top of the slide pillar **43**. The power-line clamp **21** is attached to a top of a line-support platform **44** with the switch rod **22** for holding the power line **11**.

The slide pillar **43** has a slide aperture **45** for receiving a slide rod **46** having a connection insert **47** on a first end and a slide-rod axle **48** on a second end.

The connection insert **47** is articulated to contact a bottom end of the switch rod **22** and the terminal end **7** of the link bolt **4** for conveying lightning current to the lightning arrester **1**.

A lever-link rod **49** is positioned intermediate the slide rod **46** and the control lever **23** with a first end of the lever-link rod **49** attached pivotally to the slide-rod axle **48** and a second end of the lever-link rod **49** attached pivotally to the control lever **23** with a lever-link axle **50**;

The control lever **23** is attached pivotally to the slide-fulcrum pillar **42** with the control-lever axle **25**.

The switch rod **22** is extended downward vertically from the line-support platform **44** for contacting the connection insert **47** with the slide safety switch **40** being in a closed-circuit mode with the control lever **23** oriented pivotally for sliding the slide rod **46** in opposite directions selectively.

The control-lever axle **25** is positioned predeterminedly above the slide platform **41** for allowing the control-lever **23** to be pivoted with the control-lever handle **24** being raised above a horizontal attitude of the control lever **23** for sliding the slide rod **46** and thereby moving the connection insert **47** out of contact with the terminal end **7** and the switch rod **22** for breaking circuitry of the counter-lever safety switch **14** or optionally with the control-lever handle **24** being lowered below the horizontal attitude of the control lever **23** for sliding the slide rod **46** and thereby moving the connection insert **47** out of contact with the terminal end **7** and the switch rod **22** for breaking circuitry of the counter-lever safety switch **14** with the lever-link rod **49** having a double-end pivotal contact with the slide rod **46** and the control lever **23**.

As shown in **FIGS. 9-10**, the slide rod **46** can include an inwardly opening length for positioning the connection insert **47** in a closed mode of the counter-lever safety switch **14** with the connection insert **47** in electrical communication with the terminal end **7** and the switch rod **22** by positioning of the control lever **23** and the lever-link rod **49** collinearly in line and for positioning the connection insert **47** inwardly towards the slide pillar **43** by optionally upward or downward pivoting of the control lever **23**.

As shown in **FIGS. 11-13**, the slide rod **46** can include an outwardly opening length for positioning the connection insert **47** in a closed mode of the counter-lever safety switch **14** with the connection insert **47** in electrical communication with the

terminal end **7** and the switch rod **22** by positioning of the control lever **23** and the lever-link rod **49** collinearly in line and for positioning the connection insert **47** outwardly in an opposite direction from the slide pillar **43** by optionally upward or downward pivoting of the control lever **23**.

For controlling sliding travel of the slide rod **46**, the switchable lightning-arrester system can further comprise a connector-side pillar groove **51** positioned circumferentially in an inside perimeter of the slide aperture **45** proximate a connector side of the slide pillar **43**. A lever-side pillar groove **52** is positioned circumferentially in an inside perimeter of the slide aperture **45** proximate a lever side of the slide pillar **43** and a slide groove **53** is positioned in an outside periphery of the slide rod **46**.

The slide groove **53** is articulated to receive a major cross-sectional portion of a toroidal resilient washer. The connector-side pillar groove **51** is articulated to receive a remaining minor cross-sectional portion of the toroidal resilient washer and the lever-side pillar groove **52** is articulated to receive the remaining minor cross-sectional portion of the toroidal resilient washer for restraining travel of the slide rod **46** from optionally open and closed modes of the counter-lever safety switch **14**.

The switchable lightning-arrester system can further comprise a pillar stop **54** on the slide-fulcrum pillar **42** articulated and positioned for arresting downward travel of the control lever **23**.

The switchable lightning-arrester system can further comprise a lever stop **55** on the control lever **23** that is articulated and positioned for arresting downward travel of the control lever **23**.

Referring to **FIGS. 14-19**, for hinge-connection switching, the switchable lightning-arrester system can comprise the lightning arrester **1** having the base end

2, the power-line end 3 and the link bolt 4 positioned internally from arrester fins 5 of the lightning arrester 1. The link bolt 4 has the ground end 6 proximate the base end 2 and the terminal end 7 proximate the power-line end 3. The arrester-attachment base 8 is articulated for receiving the base end 2 of the lightning arrester 1 predeterminedly for attaching the lightning arrester 1 to the power-line support 9. The safety-switchable connector 10 is positioned proximate the power-line end 3 of the link bolt 4 for open and closed switching of electrical communication from the power line 11 to the link bolt 4. The safety-switchable connector 10 for this embodiment includes a hinged safety switch 56 having a hinge rod 57 proximate the base end 2 of the lightning arrester 1. The hinge rod 57 is positioned in a hinge bay 58 on the arrester-attachment base 8 for pivoting the lightning arrester 1 orthogonally to an axis of the hinge rod 57. The lightning arrester 1 is pivotal interchangeably between a closed mode of the hinged safety switch 56 with the terminal end 7 of the link bolt 4 in electrical communication with the switch rod 22 and an open mode of the hinged safety switch 56 with the terminal end 7 of the link bolt 4 being removed pivotally from the electrical communication with the switch rod 22.

The ground-line connector 12 proximate the ground end 6 of the link bolt 4 is articulated for connecting a ground line 13 to the link bolt 4.

The hinge bay 58 is bifurcated in bifurcation arms 59 extended from the arrester-attachment base 8. The terminal end 7 of the link bolt 4 is positioned in a handle base 60 from which the control lever 23 having the control-lever handle 24 is extended laterally for positioning the hinge rod 57 in and out of the hinge bay 58 and for pivoting the lightning arrester 1 to and from a closed mode of the hinged safety switch 56. The terminal end 7 can include a latch knob 61 that is latched with

a spring latch **62** that is extended laterally from a latch stop connecter **63** that is in electrical communication with the switch rod **22** for communicating lightning current from the power line **11**, through the switch rod **22**, through the spring latch **62** and into the terminal end **7** of the link bolt **4**. The latch stop connector **63** stops pivotal travel of the lightning arrester **1** beyond a position of electrical connection of the latch knob **61** with the spring latch **62**.

The bifurcation arms **59** can include arcuate guides **64** for guiding a portion of the lightning arrester **1** containing the hinge rod **57** between the bifurcation arms **59** while the hinged safety switch **56** is being opened and closed with the control lever **23**.

The base end **2** of the lightning arrester **1** has an attachable hinge-rod base **65** from which the hinge rods **57** are extended from opposite sides.

The hinged safety switch **56** can include a support connector **66** extended intermediate the arrester-attachment base **8** and the line-support platform **44**.

Referring to **FIGS. 20-25**, for a pivotal connection, the switchable lightning-arrester system can include the lightning arrester **1** having the base end **2**, the power-line end **3** and the link bolt **4** positioned internally from arrester fins **5** of the lightning arrester **1**. The link bolt **4** has the ground end **6** proximate the base end **2** and the terminal end **7** proximate the power-line end **3**. The arrester-attachment base **8** receives the base end **2** of the lightning arrester **1** predeterminedly for attaching the lightning arrester **1** to the power-line support **9**. The safety-switchable connector **10** proximate the power-line end **3** of the link bolt **4** for open and closed switching of electrical communication from the power line **11** to the link bolt **4** includes a pivot safety switch **67** positioned on the power-line end **3** of the lightning arrester **1**.

The pivot safety switch **67** has a connector base **68** that is attached detachably to the power-line end **3** of the lightning arrester **1**. A support pillar **76** is extended orthogonally from the connector base **68** to the line-support platform **44**.

A first connector boss **69** is extended predeterminedly from the connector base **68** in a direction towards the line-support platform **44**. A second connector boss **70** is extended predeterminedly from the line-support platform **44** in a direction towards the connector base **68**. A connector plug **71** is positioned removably in electrical communication with the first connector boss **69** and the second connector boss **70**. The connector plug **71** is affixed to a pivot member **72** that is pivotal from a pivot axle **73** on a predetermined side of the first connector boss **69** and the second connector boss **70** for pivoting the connector plug **71** into and out from electrical communication with the first connector boss **69** and the second connector boss **70** selectively.

The first connector boss **69** is in electrical communication with the terminal end **7** of the link bolt **4**. The second connector boss **69** is in electrical connection with the switch rod **22** for electrical communication with the power line **11**.

As shown in **FIGS. 20-21**, the predetermined side of the first connector boss **69** and the second connector boss **70** on which the pivot member **72** is positioned can include a connector-base side with the pivot axle **73** positioned on the connector base **68** for pivoting the pivot member **72** in a direction towards the lightning arrester **1** for removing the connector plug **71** from intermediate the first connector boss **69** and the second connector boss **70**.

As shown in **FIGS. 24-25**, the predetermined side of the first connector boss **69** and the second connector boss **70** on which the pivot member **72** is positioned can include a line side with the pivot axle **73** positioned on the line-support platform **44**

for pivoting the pivot member **72** in a direction opposite from the lightning arrester **1** for removing the connector plug **71** from intermediate the first connector boss **69** and the second connector boss **70**.

The pivot axle **73** is preferably but need not be in line with the an axis of the link bolt **4** and the switch rod **22**. Being in line makes a better contact of the connector plug **71** with the first connector boss **69** and the second connector boss **70**.

The connector plug **71** can include tapered sides **74** and the first connector boss **69** and the second connector boss **70** include tapered ends **75** that match taper of the tapered sides **74**.

The pivot member **72** can include the control lever **23**.

Referring further to **FIGS. 20-25**, the switchable lightning-arrester system can have the pivot safety switch **67** being attachable detachably to the terminal end **7** of the link bolt **4** proximate the power-line end **3** of the lightning arrester **1**. The pivot safety switch **67** has the connector base **68** that is attached detachably to the power-line end **3** of the lightning arrester **1**. The support pillar **76** is extended orthogonally from the connector base **68** to the line-support platform **44**. The first connector boss **69** is extended predeterminedly from the connector base **68** in the direction towards the line-support platform **44**. The second connector boss **70** is extended predeterminedly from the line-support platform **44** in the direction towards the connector base **68**. The connector plug **71** is positioned removably in electrical communication with the first connector boss **69** and the second connector boss **70**. The connector plug **71** is affixed to the pivot member **72** that is pivotal from the pivot axle **73** on a predetermined side of the first connector boss **69** and the second connector boss **70** for pivoting the connector plug **71** into and out from electrical communication with the first connector boss **69** and the second connector boss **70**

selectively. The first connector boss **69** is in electrical communication with the terminal end **7** of the link bolt **4** and the second connector boss **69** is in electrical connection with the switch rod **22** for electrical communication with the power line **11**.

As shown in **FIGS. 20-21**, the predetermined side of the first connector boss **69** and the second connector boss **70** on which the pivot member **72** is positioned can include the connector-base side with the pivot axle **73** positioned on the connector base **68** for pivoting the pivot member **72** in the direction towards the lightning arrester **1** for removing the connector plug **71** from intermediate the first connector boss **69** and the second connector boss **70**.

As shown in **FIGS. 25-25**, the predetermined side of the first connector boss **69** and the second connector boss **70** on which the pivot member **72** is positioned can include the line side with the pivot axle **73** positioned on the line-support platform **44** for pivoting the pivot member **72** in the direction opposite from the lightning arrester **1** for removing the connector plug **71** from intermediate the first connector boss **69** and the second connector boss **70**.

The pivot axle **73** is preferably but not necessarily in line with the an axis of the link bolt **4** and the switch rod **22** of the lightning arrester **1** to which the pivot safety switch **67** is attachable.

The connector plug **71** can include tapered sides **74** in combination with the first connector boss **69** and the second connector boss **70** which include tapered ends **75** that match taper of the tapered sides **74**. The pivot member **72** can include the control lever **23**.